

**REMARKS**

Reconsideration of the application is respectfully requested in view of the following responsive remarks. For the Examiner's convenience and reference, Applicant's remarks are presented in the order in which the corresponding issues were raised in the Office Action.

In the Office Action of February 12, 2007, claims 1-22 were rejected under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Pat. No. 6,203,899 (hereinafter "Hirose") in view of U.S. Pat. No. 5,372,884 (hereinafter "Abe") and U.S. Pat. No. 3,007,878 (hereinafter "Alexander"), further in view of U.S. Pat. No. 5,965,252 (hereinafter "Santo").

It is respectfully submitted that the presently pending claims be allowed based on the remarks below.

*Rejections Under 35 U.S.C. § 103*

The Examiner has rejected claims 1-22 U.S.C. § 103(a) as being unpatentable over several references. Before discussing the obviousness rejections herein, it is thought proper to briefly state what is required to sustain such a rejection. The issue under § 103 is whether the PTO has stated a case of *prima facie* obviousness. According to the MPEP § 2142, the Examiner has the burden and must establish a case of *prima facie* obviousness by showing the prior art reference, or references combined, teach or suggest all the claim limitations in the instant application. Further, the Examiner has to establish some motivation or suggestion to combine and/or modify the references, where the motivation must arise from the references themselves, or the knowledge generally available to one of ordinary skill in the art. The Applicant respectfully asserts the Examiner has not satisfied the requirement for establishing a case of *prima facie* obviousness in any of the rejections.

Emphasis on the independent claims is provided herein, as the Applicant asserts that these claims are all patentably distinct over the prior art. Specifically, the Examiner has rejected claims 1-22 as being obvious in view of Hirose, Abe, Alexander, and Santo. Thus, a brief discussion of these references is believed to be in order.

*Hirose*

Hirose discloses a printing medium containing a liquid-absorbent base material; an ink-receiving layer consisting of a pigment, a binder, and a cationic substance; and a surface

layer consisting of cationic ultrafine particles. Hirose exemplifies the ultrafine particles as two distinct species: first, as "silica subjected to a surface treatment with a compound containing some of the cationic metal oxides or metal atoms as described above," which were "magnesium, calcium, aluminum, zinc, chromium, iron, copper, tin, lead, and manganese," and second, as "silica subjected to a surface treatment with an organic compound having both amino group or quaternary ammonium group thereof and functional group having reactivity to a silanol group on the surface of the silica." See col. 4, lines 18-25. The Examiner also states that the cationized silica is formed either by treating it with a metal oxide or by treating it with organic compound having both an amino or quaternary ammonium group and a functional group. See February 6, 2006 Office Action, page 5, and September 21, 2006 Office Action, page 3.

*Abe*

Abe discloses an ink-jet recording sheet comprising a support and ink receiving layer wherein the ink receiving layer contains a cation-modified non-spherical colloidal silica. The silica is cation-modified by coating the silica with a hydrous metal oxide such as hydrous aluminum oxide, hydrous zirconium oxide, or hydrous tin oxide as carried out by the methods in Alexander. See col. 2, lines 48-58. The Examiner describes Abe in the same fashion. See February 6, 2006 Office Action, page 5, and September 21, 2006 Office Action, page 4.

*Alexander*

Alexander discloses the methods of making positively charged particles of dense silica by mixing them with a basic salt of a metal having a valence of 3 to 4, such as basic aluminum chloride. See col. 1, lines 11-16; col. 2, lines 21-26; col. 4, lines 9-11. The Examiner also states the Alexander teaches the "forming [of] a stable aquasol of positively charged coated silica particles." See February 6, 2006 Office Action page 5, last paragraph, and September 21, 2006 Office Action, page 4.

*Santo*

Santo discloses a printing medium comprising a substrate and an ink receiving layer. The ink receiving layer comprises an alumina hydrate surface-treated with a coupling agent. See Abstract. The coupling agent is preferably a silane coupling agent. See col. 7, lines 22-24. The Examiner also states that Santo teaches "an alumina hydrate surface-treated in an

aqueous dispersion with a silane coupling agent . . . ." See February 6, 2006 Office Action, page 7, and September 21, 2006 Office Action, page 4.

*Discussion*

The Examiner has rejected claims 1-22 using a combination of the aforementioned four references; Hirose, Abe, Alexander, and Santo. Each claim is directed to a method that requires at least three specific steps. First, the silica is dispersed in water. Second, the silica's negative charge is reversed by a surface-activating agent forming a surface-activated silica. Third, the surface-activated silica is then reacted further with an organosilane reagent to form a reagent-modified and surface-activated silica. Dependent claims 2-4 vary the order of the first two steps of the method but the reagent-modifying step is always performed such that the organosilane reagent is attached to the surface-activated silica, which requires that the surface-activated silica exist before or as the organosilane reagent is attached.

The rejection based on the combination of Hirose, Santo, Abe and Alexander fails to teach each and every element of the present invention. Specifically, the combination of references fails to teach at least (a) modifying a pre-modified silica particle, (b) cationizing surface of silica and modifying silica with organosilane reagent, and (c) organosilane reagents contacting surface-activated silica particulates.

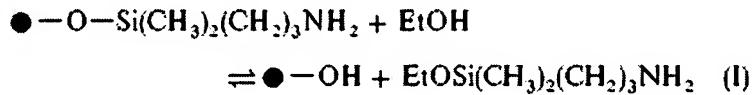
**The combination of references fails to teach modifying a pre-modified silica particle**

None of the cited references teach the present process, nor do they teach modifying a pre-modified silica particle. The present invention modifies silica by reversing the net charge by using a surface activating agent and also further modifies the surface-activated silica particulates by contacting them with organosilane reagents to form reagent-modified and surface-activated silica particulates. All of the references cited are directed towards surface modification by traditional methods.

The Examiner has combined three silica references with an alumina reference. Hirose, Abe, and Alexander are silica references, each referring to silica particles and specifically teaching silica surface treatment. None of Hirose, Abe, or Alexander teach further modification of the treated silica particle. Santo is directed to alumina particles and does not discuss surface treatment of silica particles, let alone modifying silica particles twice.

The Examiner has compared the alumina hydrate of Santo to the coated silica of Hirose, Abe, and Alexander. However, as discussed at length in previous responses (see Response dated August 22, 2006, and Response dated December 21, 2006), such a comparison is improper. Hirose teaches similar chemistry to Santo; the difference being one is a silica particle and the other is an alumina particle. The Examiner, in an attempt to combine the references to meet the presently pending claims, has compared an aluminum hydrate used to form a surface activated silica particulate (i.e. a coating) to an alumina hydrate particle. Therefore, Hirose, Abe, and Alexander can be viewed as being directed to activating a silica particle with a surface activating agent, and Santo is directed to surface-treating alumina hydrate particles.

The actual surface chemistry is well known and consists of the oxygen on the surface of the particle bonding to the silicon atom as the ethoxy group leaves as represented in the following reaction scheme (I):



Where  $\bullet$  represents the silica

At best, Hirose in view of Abe/Alexander would be a partially covered silica particle surface-activated by basic aluminum chloride in an aqueous environment while the surface of Santo would teach a similarly modified alumina particle. These surfaces are not the same.

As shown, then, neither separately nor in combination do the references teach modifying a pre-modified silica particle.

**The combination of references fails to teach the element of cationizing the surface of silica and modifying silica with organosilane reagent**

By the Examiner's own admission, Hirose "fails to teach that (i) colloidal silica particles are treated first with alumina or alumina hydrate so that a negative charge on its face changes to a positive charge forming cationized silica then the cationized silica having on its surface alumina or alumina hydrate is contacted with the organosilane reagent to form organosilane modified cationized silica; (ii) colloidal silica particles are treated with the cationic alumina and alumina hydrate by dispersing silica particles in an aqueous environment to form an aqueous dispersion." See September 21, 2006 Office Action, page 3.

Santo fails to teach cationizing the surface of silica. Therefore, neither teaches the element of cationizing the surface of silica and modifying silica with organosilane reagent.

Methods are unique in that finding one claim aspect or step here, and another there does not, in and of itself, necessarily disclose the method to one of ordinary skill in the art. This is particularly true with chemical methods or processes, wherein the steps are often inter-related. With organic chemical reactions, it is important to note that the starting materials must be compatible with the reaction scheme. Varying starting material or solvents can have negative effects on the resulting product in any given scheme. As a previously-cited example, Gringnard reactions are notoriously dangerous as they can be highly exothermic and can explode if the reaction conditions are not closely tailored for the starting materials. Additionally, if water is present in the reaction mixture, it will hinder if not completely eliminate any resulting product. Similarly, in the present reaction method, though not dangerous, a failure to perform this precise method could result in mixing the functional groups of the organosilane reagents with metal oxides or aluminum hydrates, which may not be compatible. Further, failure to perform the precise method may not lead to the reagent-modified and surface-activated silica particulates as required by the present claims.

None of the references teach the element of cationizing the surface of the silica and modifying the surface-activated silica particulates with organosilane reagent. As previously noted, the Examiner has included the combination of Hirose, Abe, and Alexander to teach cationizing the surface of silica. Santo has been included in an attempt to remedy the deficiency in teaching contacting the surface-activated silica particulates with organosilane reagents. It is the Applicant's position that Santo does not teach contacting the surface-activated silica particulates with an organosilane reagent, however, assuming *arguendo* that Santo did teach this element, it does not teach cationizing the surface of silica. On the other hand, the combination of Hirose, Abe, and Alexander does not teach contacting the surface-activated silica particulates with organosilane reagents. In other words, the step of contacting the surface activated silica particles with an organosilane reagent cannot be present in any of the references, because none of the references teach both types of treatment, and thus, this interconnection of steps cannot be taught by the cited references.

Further, the present claims are directed to methods, and as such, finding one claim aspect or step here, and another there does not, in and of itself, necessarily disclose the method to one of ordinary skill in the art. In the present case, the Examiner has allegedly identified one aspect of the method in a combination of three references, and allegedly

identified another aspect in still a different reference. Both the reversing the net charge of the surface of the silica particulates and the contacting the surface-activated silica particulates with organosilane reagents are necessary to produce reagent-modified and surface-activated silica particulates. The cited references do not teach the required claim element of cationizing the surface of the silica and then modifying the surface-activated silica particulates with organosilane reagent. No reference teaches modifying surface-activated silica with an organosilane reagent.

**The combination of references fails to teach organosilane reagents contacting surface-activated silica particulates**

The combination of references cited by the Examiner fails to teach organosilane reagents contacting surface-activated silica *particulates* to form *reagent-modified and surface-activated silica particulates*. Hirose, Abe and Alexander are silica references. Each refers to silica particles and specifically teaches silica surface activation. Santo, on the other hand, is directed to alumina particles and not to coatings. Santo teaches alumina particle surface activation. The Examiner continues to rely on alumina hydrate particles of Santo and alumina hydrate coated particles of Hirose being the same.

As previously argued in past office action responses, Santo teaches a surface-activated alumina hydrate. To be clear, alumina hydrate is not the aluminum chloride hydrate as found in the Applicant's disclosure. Alumina and aluminum are distinct in this context; the first referring to a particle and the later referring to an individual atom which is part of a chemical molecule. Specifically, in Santo, alumina is a particle having "pore properties" "within a range of from 0.1 to 1.0 ml/g" and a "specific surface area" "of from 40 to 500 m<sup>2</sup>/g." See col. 4, lines 15, 19-21, 25-26. The surface of the alumina can be modified to have Al-O, Al-OH, or Al-H as well as an Al-silane coupling agent. See col. 3, lines 60-65; col. 4, lines 39-43. Therefore, the alumina activated surface of Santo and the silica activated surface of Hirose, Abe, and Alexander are similar in at least one way, in that they both include particles that have chemicals attached thereto. The aluminum chloride hydrate of the present invention is more of a chemical coating, whereas the alumina hydrate of Santo is a particle.

The present invention is directed to a method that includes an organosilane reagent attaching to the surface-activated silica, which requires that the surface-activated silica exist before or as the organosilane reagent is attached. The surface activating agent, aluminum

chloride in the above discussion, serves more of a coating in the present invention, and is therefore distinct from the alumina chloride of Santo.

Therefore, the Applicant submits that the Examiner has failed to present a *prima facie* case of obviousness for lack of teaching all the claim limitations in the instant application. Specifically, the combination of references fails to teach (a) modifying a pre-modified silica particle, (b) cationizing surface of silica and modifying silica with organosilane reagent, and (c) organosilane reagents contacting surface-activated silica particulates, all taught and required by the present claims. As such, Applicant respectfully requests that the Examiner withdraw the rejection and allow of the claims.

CONCLUSION

In view of the foregoing, Applicants submit that claims 1-22 present allowable subject matter and allowance is respectfully requested. If any impediment to the allowance of these claims remains after consideration of the above remarks, and such impediment could be removed during a telephone interview, the Examiner is invited to telephone W. Bradley Haymond (Registration No. 35,186) at (541) 715-0159 so that such issues may be resolved as expeditiously as possible.

Please charge any additional fees except for Issue Fee or credit any overpayment to Deposit Account No. 08-2025.

Dated this 14<sup>th</sup> day of May, 2007.

Respectfully submitted,



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